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25years of recombinant DNA vaccine for livestock

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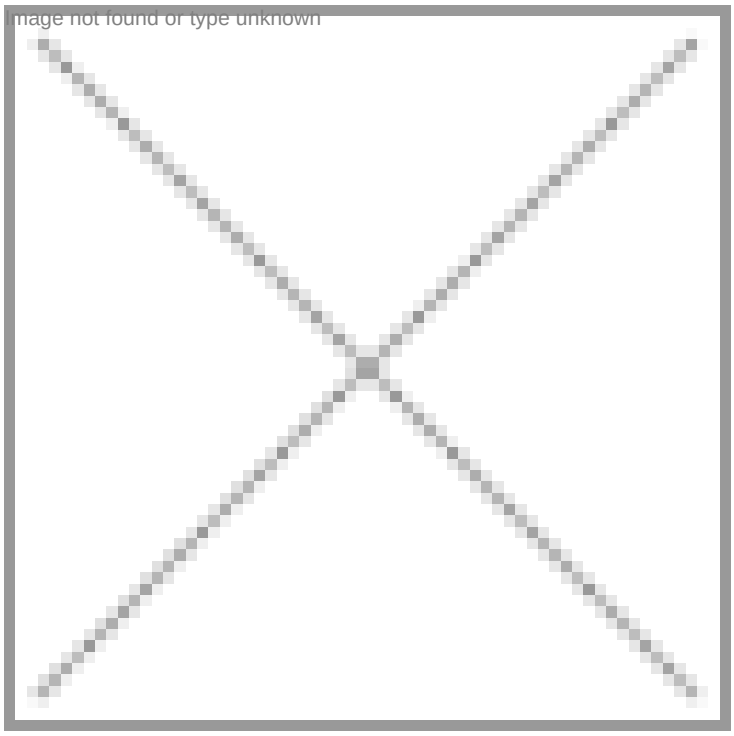

25years of recombinant DNA vaccine for livestock

The dependence on livestock is more in developing countries and is particularly important to poor people. Developing countries value livestock products (milk, meat, eggs) that provide income to farmers. Until sometime in the past, the animal vaccine range that was available was not significant and it also did not address several animal diseases of concern. The animal biologicals market still largely lives on conventional vaccines based on primary cell culture or mammalian cell cultures. This contrasts with the development in the west, where we now have recombinant vaccines, (eg. against ticks) DNA vaccine (eg. against West Nile fever) and live vector vaccines (eg. pox vector). It was in 1982 that the first recombinant DNA vaccine for livestock was developed.

Advantages

An advantage of the vaccines made through recombinant DNA technology is that they use only a small portion of the original microbe. Conventional vaccines use killed or weakened forms of the disease-causing microbe. Sometimes, when the microbes are not completely killed or sufficiently weakened, a conventional vaccine may cause the disease it was supposed to prevent. Disease-causing genes are not included in the genetically engineered vaccines. Therefore, the recombinant vaccines build up the body's immunity without the risk of causing disease. They can be developed at a higher speed as compared to conventional vaccines, the development of which can take 20 to 30 years, or maybe even 100 years.

Recombinant vaccines are being developed for foot-and-mouth disease, a highly contagious viral disease that infects cattle,

sheep, and other animals. It causes substantial livestock productivity losses elsewhere, particularly in developing countries. Conventional foot-and-mouth disease (FMD) vaccines are made by weakening the virus that causes the disease. These vaccines sometimes revert to the virulent state, and they have caused outbreaks of the disease in Europe. The FMD vaccine made with biotechnology cannot cause the disease because, as in other biotech vaccines, the disease-causing genes have been removed. The biotech vaccine does not need to be kept cold and, therefore, can be used in developing countries.

Indian scenario

Companies with animal health divisions based in India are: Bayer, Hoechst, Pfizer, Glaxo Wellcome, American Home products and Sarabhai. Smaller firms involved in animal health biotech are Indovax (New Delhi), Shubh (Ahmedabad), Indian Immunologicals (Hyderabad), Venkateshwara Hatcheries (Pune). A new impetus has been given to the development of animal vaccine and diagnostics. Phase I/II human clinical trials of recombinant anthrax vaccine is being done at three centers. Another new generation improved anthrax vaccine using non-toxic mutants of anthrax toxin proteins has also been developed and its in vitro toxicity studies have been carried out. Vaccines for rabies, clostridium, haemorrhagic septicaemia, FMD, bovine brucellosis, bovine tuberculosis and haemonchus controtus are in various stages of development.

A complete health package for infectious bovine rhinotracheitis (IBR) disease including diagnostics and vaccine has been developed and the technology transferred to the industry. Rabies vaccine for animals using laboratory rabies strain PV-11 seed virus has been developed. Recombinant protective antigen against anthrax has been developed and technology transferred to the industry.

The laboratory at NDDB has developed a Sensitive Test for identification of the pathogenic enterotoxigenic Escherichia coli, a causative agent of diarrhoea in calves. Efforts are now underway to develop a recombinant vaccine against rotavirus, another agent involved in calf diarrhoea. Currently, alum precipitated vaccine is widely used in India to prevent haemorrhagic septicaemia, an acute bacterial disease caused by two serotypes (B&E) of Pasteurella multocida. The laboratory is now developing a recombinant vaccine using gene coding for outer membrane proteins of the organism.